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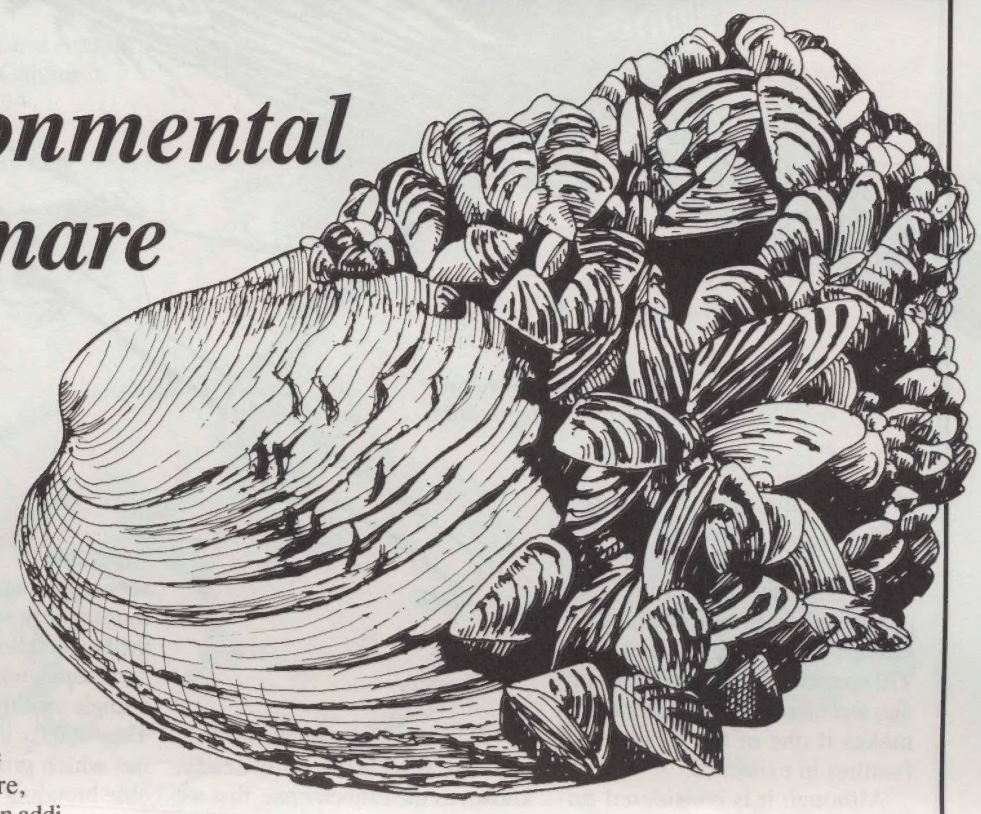
Zebra Mussels:

North American Environmental and Economic Nightmare of the Nineties



Living colony of zebra mussels attached to a native freshwater clam

What are they?

Zebra mussels have been described by the media as being both crustaceans and parasites. They are neither. The scientific name for these small, shelled invertebrates is *Dreissena polymorpha*. Like oysters, clams, snails, squid, octopus and slugs, they belong to the second-largest group of animals on earth: the molluscs.

Molluscs like oysters, scallops, clams and zebra mussels are called bivalves. Unlike snails, they have two half shells rather than a single shell. Their shells do, however, serve the same purpose as a snail's shell: when closed tightly they protect the animal's soft body from predators and keep it from drying out.

Why are they called zebra mussels?

Zebra mussels were named for their distinctive zebra-stripe pattern and their resemblance to marine mussels. They vary widely in colour and degree of patterning, ranging from sandy yellowish-brown to a very dark brownish-black, and may lack stripes completely or be vividly marked. While nowhere near as large, they are similar in shape to the common marine blue mussel, *Mytilus edulis*. You may not recognize blue mussels by their scientific name; however, you may have eaten them for dinner, seen them for sale in a fish market or noticed them at the sea shore, clinging to rocks by the thousands.

Another similarity between zebra mussels and marine mussels is their ability to produce tiny, thread-like bundles of fibres called byssal threads with which they anchor themselves to rocks and other hard underwater surfaces.

Why are zebra mussels a problem?

As a result of the accidental introduction of zebra mussels, industries and municipalities that draw water from the Great Lakes are experiencing astronomic increases in their operational costs. In some areas, zebra mussels have caused up to 60% reductions in water flow through intakes and forced operational shut downs to permit emergency maintenance. To date, millions of dollars have been spent trying to combat and control zebra mussels, and the costs will likely exceed tens of billions as these small bivalves spread into new areas.

Zebra mussels are not only clogging industrial and municipal intakes, but also your personal water intake at the cottage. They also foul fishing nets, boat engines, hulls and other equipment; reduce and possibly eliminate certain native sport and commercial fish species and other wildlife; ruin swimming areas, and spoil scuba divers' enjoyment by obliterating underwater wrecks. The costs of ongoing maintenance and repairs arising from zebra mussel control efforts will, in the case of industry and municipalities, no doubt be transferred directly to consumers and taxpayers: you and me. In Lake Erie, the home of the largest commercial freshwater fishery in the world, and major sport fishing areas, the effects of the introduction of the zebra mussel could be devastating. Commercial and sport fisheries contribute billions of dollars to Ontario's economy every year. Already, in Lake Erie, problems caused by the zebra mussel invasion are apparent. Fishing nets are being hauled in completely covered with zebra mussels. Commercial and sport fish species are facing increased competition and habitat alteration: fisheries biologists fear this will lead to reduced populations and perhaps the outright disappearance of some species.

While it is easy to see that the introduction of zebra mussels inflicts yet another heavy and ongoing economic burden on our society, their arrival is likely to be even more disastrous for the environment. In fact, the successful establishment of zebra mussels in North America may be a far worse environmental catastrophe than the much publicized *Exxon Valdez* oil spill. Their effect on freshwater ecology will be far more insidious, widespread and severe over the long term. The introduction of this exotic species may irreversibly alter freshwater ecosystems in all of southern Canada and two-thirds of the U.S.A. Currently, zebra mussels are taking over spawning grounds critical to both sport and commercial fish species, and fisheries biologists are not sure how this will affect these fisheries. They are, however, worried: in addition to taking over fish spawning grounds, zebra mussels are voracious feeders and will compete with larval and juvenile fish for food as well as for oxygen, both of which are essential to maintaining healthy fish populations.

A zebra mussel's seemingly insatiable appetite and its high rate of filtration (estimated at approximately one litre of water per day per adult mussel) is resulting in some dramatic improvements in water visibility. At first, this improvement in water clarity appeared to be a benefit. However, researchers now worry that such increases in visibility will drive

(continued on page 4)

From the Director's Desk:

Yesterday and Tomorrow

Last night I sat down to prepare a talk on underwater photography for the local camera club. In looking for slides to illustrate old techniques, I discovered images from several coral reefs taken 30 years ago. A riffle through more slide files turned up recent pictures from the same locations. What a difference! In Barbados, the shallow reefs off the west coast were vibrant and alive in 1962. Today, they are rubble. Off Lyford Key, Nassau, in 1960, great stands of palm coral majestically held their branches in the swirling water. Few can be found there today. Of course, not all examples were bad; a few slides (very few) showed equally luxuriant growths past and present. But even some of the deeper reefs showed marked reductions in the amount of living coral and gorgonians. In the same dusty pile, I found images of myself and colleagues as we began our scientific careers, surrounded by equipment that by today's standards would be not only primitive, but downright dangerous to use. Even some beautiful shots of my children were hidden there.

This mixture of pictures, some of interest only to me and my family, others of interest to science, or to history, is probably typical of most of our personal records. Unless I find a permanent place to house the images of interest to science, they probably will be passed on to my children and undoubtedly eventually lost or discarded. Have you ever wondered how much of value is lost to human knowledge this way? Does it ultimately matter? The reef pictures, like some images or artifacts you might have, document a baseline of information invaluable in understanding the progress of change, its nature and its pace; invaluable information to scientists attempting to predict the future of reefs.

Our museum, like other museums in the world is a unique storehouse of records, information, specimens, and artifacts of human and natural processes. The people who study and work with this material not only create an understanding of the past, they also create a view of ourselves and the world in which we live. Their research ensures that we as human beings know and understand who we are and where we came from. Perhaps the world has always been troubled, but I feel this is an especially tumultuous time of political and cultural change. We stand on the brink of deciding whether our human species — as well as others —can continue to exist long into the future. The potential damage we can do to our natural environment is sufficient to put our own species in severe danger of extinction. Only natural history museums, with their collections and researchers, can provide the information base on which to make this judgement. At times like this, I am glad we have a community of museums dedicated to preserving the examples, creating the understanding, and communicating the knowledge we must have to make those decisions.

Alan R. Emery
Director

Seedeaters: Little-known Birds

Yellow-bellied Seedeater
(Sporophila nigricollis)

Seedeaters are small birds, roughly 9.0 to 12.5 centimetres in length and from 7 to 15 grams in weight. These small passerines belong to the family Emberizidae which includes some 770 species divided into 8 subfamilies and more than 180 genera. This makes it one of the largest bird families in existence.

Although it is considered primarily a North and South American family, some groups, such as the genus *Emberiza*, which lent its name to the family, flourish in Europe and Asia. The main subfamilies of the Emberizidae include groups with species such as tanagers, cardinals, grackles, warblers, and sparrows. It is in this latter subfamily, known as the Emberizinae, that we find the seedeaters, as well as sparrows like the Song Sparrow or the White-throated Sparrow that are common in our part of the world.

This subfamily is in turn divided into several genera, including the genus *Sporophila* which comprises roughly 31 species. They range from central Mexico to central Argentina. Some of them have a very large range; others are confined to relatively small areas, such as the Hooded Seedeater (*Sporophila melanops*), which is found only at a single locality in southern Brazil. They chiefly inhabit grassy savannas which provide food and suitable breeding sites.

Seedeaters are small granivorous birds with short, heavy, curved, conical beaks. Their plumage is generally dull, but features white, black, grey, olive, yellow, chestnut and brown, at least in males, and beige, brown and white in females. Sexual dimorphism (males and females differing in colour or size) is pronounced: the males have much brighter plumage and are generally bigger than the females. They also have the ability to produce elaborate and melodious songs, whereas the females emit only simple call notes.

Outside of the breeding season, seedeaters are gregarious and cluster in flocks of varying sizes. We still know relatively little about their life patterns, but several species are migratory and at times seem to travel great distances because of seasonal changes or changes in the amounts of rain. The rainy season apparently triggers the physiological processes of breeding. Birds then separate from the flock and form pairs. The male occupies and vigorously defends a territory in savannas or grassy open spaces by singing frequently and chasing away any intruder. Meanwhile, the female he attracted and mated is busy building a fragile cup-shaped nest with loosely woven bits of grass, and its contents can be seen through the flimsy wall. The nest is usually attached to grass stems or built in a bush. Seedeaters lay about four pale, virtually white eggs, delicately speckled with slightly darker spots and often with pastel tones. The female incubates the eggs for roughly 12 days. The male helps to feed the nestlings while continuing to sing. Ten days after hatching, the young can leave the nest and the female is ready to lay a new clutch of eggs.

Male seedeaters may be distinguished from one another primarily by their general coloration patterns. Bill colour, however, provides a good clue for differentiating certain species which otherwise closely resemble one another. Several seedeater groups are distinguishable by colour combinations, such as black and white or sometimes brown. For example, at least four species are known to belong to the "black and white" group. Their ranges and the way the colours in the plumage and beak are arranged help to tell them apart. The task is easier in some species. The Yellow-bellied Seedeater (*Sporophila nigricollis*), for example, has a dark hood, olive back and whitish-yellow underparts. External morphological characteristics of the plumage found in the males of other species may also be important, along with species-specific songs, for identification in the field. Identification is much more difficult in the case of young males or females, which often lack distinctive and clearly visible markings. Since they look so much alike, it is often impossible to identify them from a distance — or even if they are held in the hand.

Species identification is only one of the many challenges in studying this group of small birds. Little is known about them although they are common in several regions of Latin America. There are still many questions about their ecology, distribution, migration patterns and, in the case of several species, their actual biological status and relationships to one another and to species in other groups. These gentle passerines continue to be sold internationally because of their pleasant song, and they are highly prized by bird lovers in some parts of the world. They deserve close attention not only because we still have a great deal to learn about them, but also because their future may be jeopardized as a result of profound changes in their habitats and the commercial market.

Henri Ouellet
Zoology

Yuppie Eels

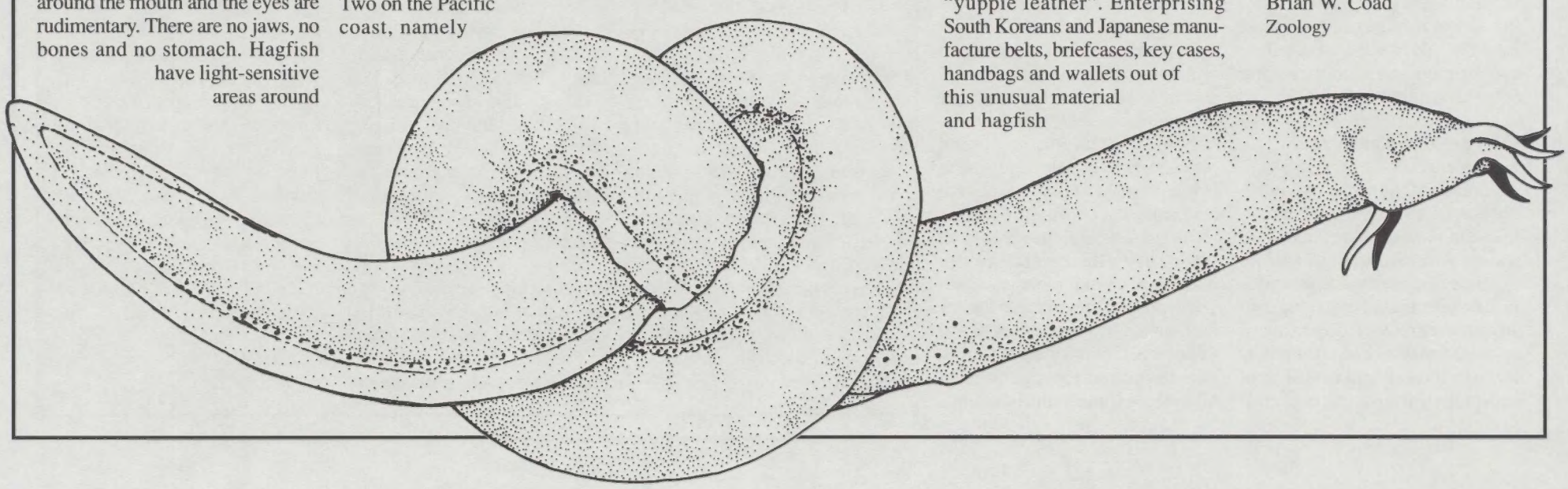
Despite their names hagfish, or slime eels, have long been known and admired by scientists. Superficially they may seem uninteresting, having simple eel-shaped bodies which may be white, pale brown or blackish. On closer examination, they reveal some very unusual characteristics. They lack the paired fins typical of fishes. There are four to six short tentacles around the mouth and the eyes are rudimentary. There are no jaws, no bones and no stomach. Hagfish have light-sensitive areas around their cloaca and several hearts that beat independently of each other. Hagfish also have a remarkable resistance to disease. Wounds remain clean for weeks without evident infection and, strangely enough, without healing either. Biomedical studies of their circulatory, endocrine and immune systems may reveal information valuable for understanding human physiology. Hagfish are the most primitive living vertebrates, only distantly related to true eels, and have been studied for that reason as well.

These fish-like vertebrates are common in Canadian waters but are seldom seen except by scientists and commercial fishermen. There are three species in Canada. Two on the Pacific coast, namely the black hagfish (*Eptatretus deani*) and the Pacific hagfish (*Eptatretus stouti*) both reaching about 64 cm, and one on the Atlantic coast, the Atlantic hagfish (*Myxine glutinosa*) reaching 79 cm. They are not valuable as food, and are a nuisance to commercial fishermen. They scavenge dead or dying fish caught in nets and cover the nets with their revolting slime. As many as 123 hagfish have been found on one Atlantic cod corpse. They feed by penetrating the fish body through a hole they rasp out with their toothed tongue and devouring the insides, leaving only a "bag-o-bones." Copious amounts of slime protect them against predators (a hagfish can easily pull itself out of a human's grip). Slime may also be useful for suffocating prey. A single hagfish, 45 cm long, can fill a bucket with slime. The hagfish divests itself of excess slime by throwing its body into an overhand knot and sliding the knot down and off. The knot is also used as purchase to tear off flesh from the prey; and the hagfish can make figure-eight loops as well. Its single nostril is used for breathing and can become clogged with slime. It is cleared by a "sneeze."

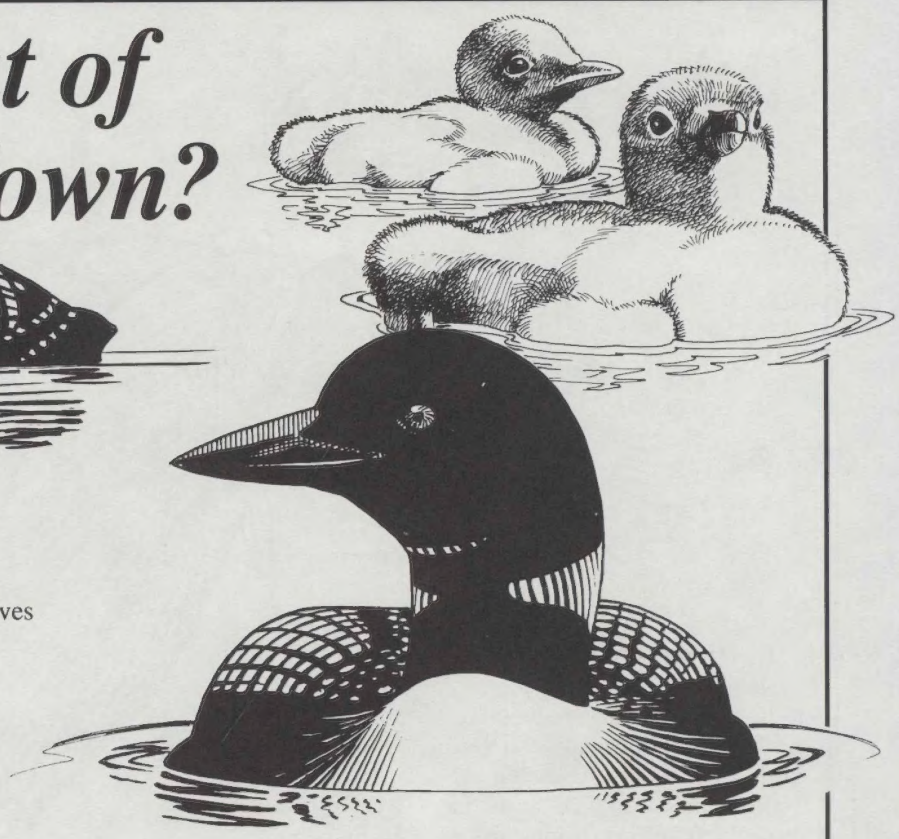
In recent years hagfish have achieved an unexpected degree of popularity in our modern, electronic society. Their skin is tough but easily removed and can be transformed into what is known as "yuppie leather". Enterprising South Koreans and Japanese manufacture belts, briefcases, key cases, handbags and wallets out of this unusual material and hagfish stocks in the western Pacific Ocean are now being over-exploited. "Eelskin" products have an estimated annual commercial value of $100 million. A nuisance animal may now become a commercial resource in Canadian waters. Hagfishing licenses have been issued by Nova Scotia and New Brunswick.

"Eelskin" wallets made from hagfish have been accused of demagnetizing bank and credit cards, perhaps because of metallic products in the skin left over from the curing process. The large numbers of magnets and magnetic-field generating machines in our environment are more likely causes than these ancient, fish-like vertebrates.

Brian W. Coad
Zoology



Out of Town?



Two new exhibits are on the road. *Cry of the Loon*, about conserving the Common Loon, and *My name is Nanuq*, the diary of a polar bear, will be travelling across Canada for the next five years. Keep a look out for these exhibits at museums, nature centres, exhibition centres and zoos near you!

Imagine waking up early at the cottage. You're the first one up. You wander down a well-worn path to the lake. All is calm, peaceful. An early morning mist rises off the water. Suddenly a mournful cry breaks the silence, sending shivers down your spine. There can be no mistaking the cry of the Common Loon.

The scene is familiar to many of us now, but acid rain, oil spills, shoreline development and human encroachment threaten the loon. As our wilderness shrinks and pollutants increase, some day people may visit our lakes and never see or hear a loon. Fortunately, there is still time to prevent such a tragedy, and many things you can do to help.

Cry of the Loon looks at human activities that threaten the survival of the Common Loon, but it is not an exhibit of despair. It shows visitors what they can do to help protect the loon and its habitat.

Do polar bears keep diaries? Nanuq did and the Canadian Museum of Nature features it in *My Name is Nanuq*.

My Name is Nanuq lets visitors enter the private life of a polar bear. In her own words, Nanuq reveals the intimate details of meeting her mate; building her snowy den and spending the winter inside giving birth to her cubs; raising the cubs and their antics; her secrets about hunting seals; and her tricks for staying cool during the summer. Don't miss the only chance you may have to learn about polar bear behaviour from Nanuq herself.

Look for the Canadian Museum of Nature's new travelling exhibits at these locations:

Cry of the Loon

Until April 23
Kamloops Museum and Archives
Kamloops, British Columbia

May 7 to July 2
Nanaimo Art Gallery and
Exhibition Centre
Nanaimo, British Columbia

July 16 to September 10
Fraser-Fort George Regional
Museum
Prince George,
British Columbia

My Name is Nanuq

Until April 23
Comité des expositions
de Val d'Or
Val d'Or, Québec

May 7 to July 2
Musée minéralogique et minier
de la région de l'Amiante
Thetford Mines, Québec

July 16 to September 10
Woodland Indian Cultural
Education Centre
Brantford, Ontario

Or check with your local museum, library or exhibition centre for information about CMN exhibits that may be coming to your area.

Morag Hutcheson
Exhibits

Museum on the Move

The Canadian Museum of Nature has begun a major programme consolidating its extensive collections and research facilities under one roof. For more than two decades, the CMN has housed its 5.5 million specimens, its laboratories, libraries and researchers in 11 leased and two Crown-owned buildings scattered around Ottawa.

In October 1990, the government bought a building and 75 hectares of surrounding land on Pinks Road in Aylmer, Quebec. The CMN has since been preparing to transfer its Collections and Research Branch to the new site. Planning is being coordinated by our Accommodation Services Division. The move is expected to take about six years, with selected areas being slated for occupancy each year. Only the Collections and Research Branch is being moved: the Museum's exhibits, directors' offices and some other functions will remain at their present locations in Ottawa.

Renovating the new quarters and outfitting them for specific museum needs is a large operation which requires cooperation among architects, engineers, contractors, movers and Museum staff. Our prime concerns are ensuring the safety and conservation of the collections and providing safe working conditions for our staff. Many of the specimens are type specimens. These are extremely important specimens because the name applied to a particular animal, plant or mineral is determined by reference to a type specimen. But even non-type specimen collections will require great care during the move.

The CMN's collections are part of the natural heritage of this country, and as such belong to the people of Canada. They are incredibly diverse: pressed herbarium plants, fish and reptiles preserved in alcohol or formalin, rocks and minerals, fossils, insects, microscopic organisms such as diatoms, pollen and worms, mammal skeletons (including huge vertebrae and skulls of whales), fungi and lichens, sea shells and many, many more. Each collection requires special preparation and packing techniques. The curators must work very closely with the technical staff and professional movers to transfer the specimens properly with minimum damage.

Three sections of the Museum will move this year. Staff in the Mammalogy section (mammals) are packing thousands of skulls and other skeletal parts of whales, bison, wolves, walruses and other animals for moving in April (see photo). The Ichthyology (fish) and Herpetology (amphibians and reptiles) sections will move in July and staff members have begun the laborious tasks of preparing glass jars and bottles for packing as well as designing the necessary floor space for shelving the collections. The move has made it necessary to rethink how specimens are stored, shelved, and protected. Each specimen requires individual attention and documentation. The Museum's Computer Services Division is providing a labelling service and a tracking system to make record keeping easier.

With such diverse collections and individual curatorial needs, any move of this magnitude will no doubt have its share of administrative and logistical problems. During the next six years or so, the Museum's need for volunteers will increase. We will need help with labelling, cleaning, packing and unpacking, general paperwork and computer data processing to keep the move on schedule with a minimum of disruption. If you are interested in helping the CMN consolidate its Collections and Research Branch, please contact: Elizabeth White, Volunteer Coordinator, at (613) 998-4200.

S.A. Jarzen

Donna Naughton prepares and labels mammal specimens for the move to new quarters

David M. Jarzen
Earth Sciences (Paleobiology)

BIOME

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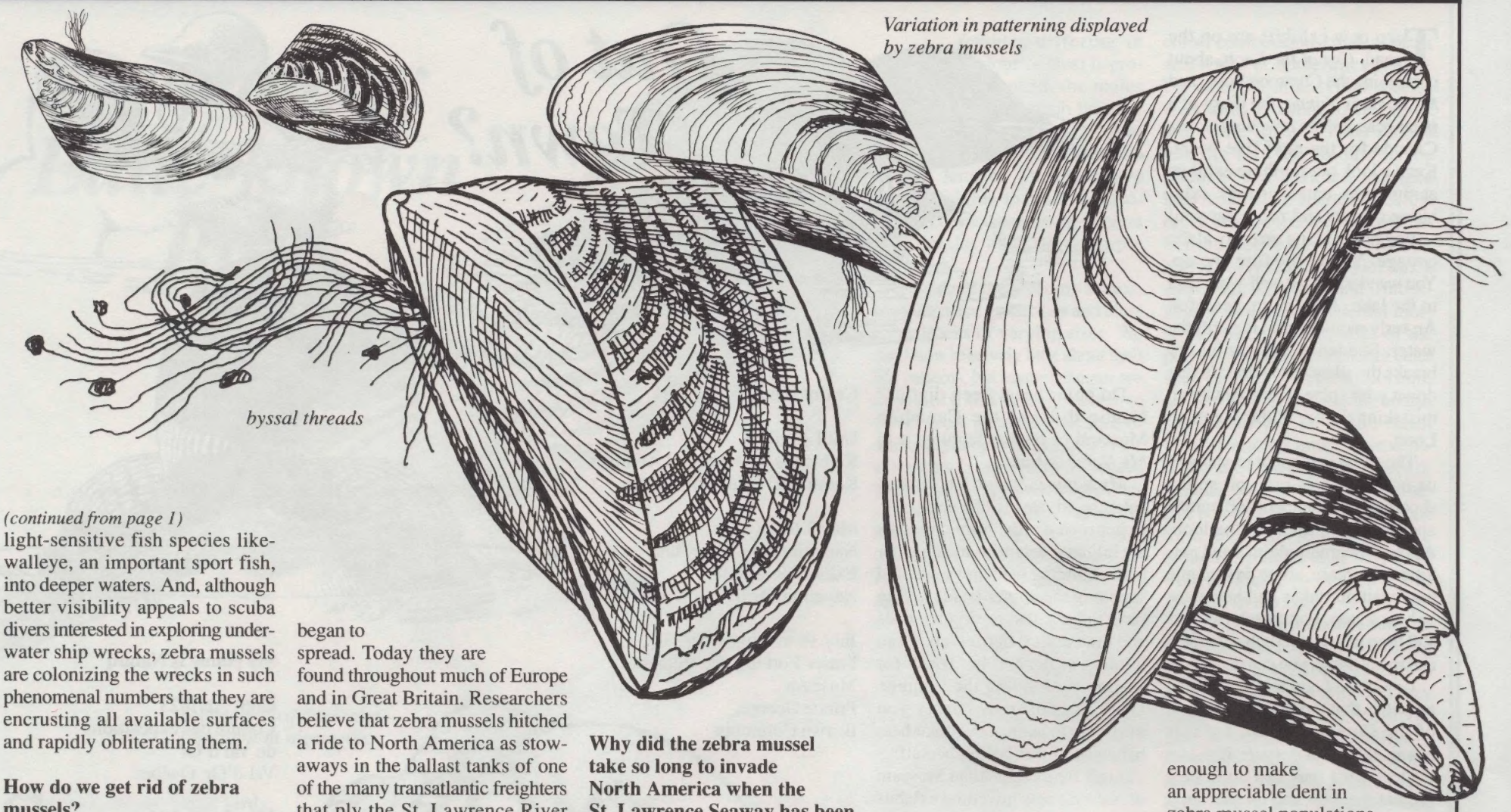

Variation in patterning displayed by zebra mussels

(continued from page 1)

light-sensitive fish species like-walleye, an important sport fish, into deeper waters. And, although better visibility appeals to scuba divers interested in exploring underwater ship wrecks, zebra mussels are colonizing the wrecks in such phenomenal numbers that they are encrusting all available surfaces and rapidly obliterating them.

How do we get rid of zebra mussels?

We can't. We will have to learn how to live around and with them. In Europe, municipalities and industries have, in the course of their long association with zebra mussels, learned how to cope with these tiny menaces by greatly increasing the diameter of all water intakes. This helps compensate for reduced water flow caused by infestations of zebra mussels and makes it easier to remove them. In Europe it is also common practice to bury water intakes in sand to reduce the number of zebra mussel larvae making their way into water systems. Here in North America, zebra mussels are spreading so rapidly that municipalities and industries are facing almost total shut down of their water intake systems before they realize they have a zebra mussel problem. For this reason special permission has been given to Ontario Hydro to use chlorination as an interim emergency control measure. The addition of chlorine or any other chemical to any freshwater ecosystem however must be avoided wherever possible, and zebra mussel control efforts must be focused on biological rather than chemical methods. Researchers are investigating potential countermeasures, including ozonation, thermal shocking and fluctuating electrical fields. Scientists are studying the biology of the zebra mussel to learn as much as they can about its life cycle, especially such important aspects as reproduction, dispersal and its habitat requirements at different life stages. Understanding the biology of the zebra mussel may provide researchers with the key to developing safe, inexpensive and reliable ways to discourage or prevent zebra mussels from settling.

Where did zebra mussels come from and how did they get into the Great Lakes?

Zebra mussels are native to the Caspian Sea and Ural River regions in eastern Europe. With the construction of canals to aid commerce in the 1800s, zebra mussels began to spread. Today they are found throughout much of Europe and in Great Britain. Researchers believe that zebra mussels hitched a ride to North America as stowaways in the ballast tanks of one of the many transatlantic freighters that ply the St. Lawrence River and Great Lakes each year. Before sailing, freighters pump millions of litres of water into ballast tanks in their holds to ensure that their cargo is balanced and that the vessel will be as stable as possible at sea. Ballast water is a "Pandora's box" of living aquatic organisms which, upon arrival at a ship's destination, are jettisoned along with the ballast water. During the shipping season it is estimated that representatives of a minimum of 18 exotic species are deposited into the Great Lakes ecosystem every day. Fortunately few of these non-native species survive in their new habitat long enough to become established. The zebra mussel is one of the exceptions. Just as it did so successfully in Europe, it is now rapidly increasing in numbers and spreading throughout Canada.

When and where did the zebra mussel first become established in the Great Lakes?

Researchers believe zebra mussels were jettisoned into Lake St. Clair, between Lake Erie and Lake Huron, in 1985 or 1986. In 1988 they were successfully established in Lake St. Clair and Lake Erie. As of August 1990, zebra mussels were established throughout Lake St. Clair and Lake Erie, downstream throughout the Niagara River, and at locations in Lake Ontario and the St. Lawrence River. Upstream of Lake St. Clair, isolated populations were established at locations such as Green Bay, in western Lake Michigan, and Duluth Harbour at the westernmost extremity of Lake Superior. In November 1990 zebra mussels had been found on the hull of a sailboat hauled out of the Ottawa River. The sailboat had come to the Ottawa area from Lake Ontario via the Rideau Canal. Considering the volume of boat traffic on the Rideau and other canal systems (Trent Severn, Erie Barge Canal, Hudson), during the tourist season, it is likely that if this tiny European mollusc has not already invaded these areas, it will do so very soon.

Why did the zebra mussel take so long to invade North America when the St. Lawrence Seaway has been open to shipping since 1959?

Ironically, one explanation is that until the early 1970s most harbours in Europe and North America were so badly polluted that zebra mussels could not survive in them. It was unlikely that they would have been sucked aboard in ballast water, and even if they had successfully reached the Great Lakes, they would have encountered such poor water quality that they probably would not have survived to reproduce. However, tighter environmental controls both in Europe and in North America resulted in greatly improved water quality. Once water quality improved, zebra mussels colonized European ports and, unfortunately, some were sucked aboard a freighter bound for the Great Lakes. When this freighter jettisoned its ballast water into Lake St. Clair, its unseen cargo of zebra mussel larvae found an extremely hospitable habitat. These tiny invaders thrived in their new environment. They matured, reproduced and rapidly established themselves, thus beginning their relentless colonization of North American freshwater systems.

What is the life history of the zebra mussel?

While much remains to be learned about the biology of *Dreissena polymorpha*, we do know that they live approximately five years and grow to a maximum of five cm in length. Females as young as one year are probably capable of producing eggs. Typically, a mature female produces approximately 30,000 to 40,000 eggs a year. Egg production begins in the spring, once water temperatures have reached 12°-15°C, and continues until temperatures drop in the fall. The microscopic eggs are released, fertilized outside the parent's shell and, within a few days, hatch into free-swimming larvae known as "veligers." Veligers are equipped with many long cilia (protoplasmic filaments) that move continuously to keep the tiny creatures suspended in the water column.

The veligers drift with the currents for about eight to fifteen days. At the end of this period the larvae must find a hard surface on which to settle; they attach themselves by secreting byssal threads. Should the habitat they select prove unsatisfactory the tiny juveniles can break their byssal attachment and drift again with the currents in the hope of finding a better site. Zebra mussels thrive wherever oxygen and food are available. They prefer a hard substrate but can successfully colonize soft bottoms by using any available hard surface as an anchor; eventually they attach to one another and form large mats. Zebra mussels feed primarily on planktonic algae and, as they filter water for suitable food, strain out virtually all particulate matter. Unsuitable food is coated with mucus and deposited on the bottom as fecal pellets. Food discarded in this way may no longer be available for other organisms such as crustaceans, which are very important in the food chain because they are consumed by larval and juvenile fish.

Don't zebra mussels have any natural predators?

Yes. Diving ducks and some fish feed on zebra mussels. In some areas of Europe overwintering diving ducks and coots are believed to consume up to 97% of the adult zebra mussels every year. But this seemingly heavy predation doesn't affect the mussel population because of their incredible reproduction and survival rate. In the Great Lakes, scaup are increasing in numbers, apparently as a direct response to the availability of zebra mussels as food. Unfortunately, unlike their counterparts in Europe, these and other diving ducks such as canvasbacks and oldsquaws do not overwinter, and therefore cannot be relied upon to help control the mussels. Fish like the freshwater drum are known to feed heavily on zebra mussels, and certain other species such as sturgeon and carp also feed on them. Fish predation is not, however, enough to make an appreciable dent in zebra mussel populations.

Are zebra mussels spread by other means than ballast water?

Yes. People can unknowingly transport zebra mussels to new bodies of water. Zebra mussel veligers are not visible to the naked eye: five larvae could fit on the period at the end of this sentence. They can easily "hitch a ride" in the cooling water for boat engines, in bilge water, in live wells where sport fishermen keep their catch alive or in the water bait is kept in. As small juveniles or adults, zebra mussels may also travel on boat hulls or engines, on bait such as crayfish or on fishing gear such as commercial nets. Wildlife may also transport zebra mussels in their wet fur or feathers.

If we can't stop zebra mussels from spreading, is there anything the average person can do?

Very definitely. Although we cannot stop their spread, we can slow them down and do as much as possible to prevent them from entering new inland lakes and new river systems. Out of the water, an adult zebra mussel can survive for several days, and in a moist environment it can live much longer. Boaters and fishermen must be extremely careful when transferring boats or equipment from one body of water to another. They should thoroughly clean and disinfect boat hulls, trim tabs, outdrives and outboard engine lower units, live wells, bait buckets and other fishing gear before entering zebra mussel-free waters. And it is essential that fishermen never pour bait and the water it was kept in, or the water from a live well, into another body of water.

We can't get rid of zebra mussels or stop their relentless spread. We can, however, slow them down and buy valuable time for researchers to find effective and environmentally safe control methods.

Jane Topping
Zoology